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(56) Documents Cited
GB 2115349 A WO 92/22039 A1 US 5104471 A
US 4501439 A US 4184700 A

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(54) Information carrier with diffraction markings

(57) An information track 10 formed by a reflection layer (3, Fig. 1) on a thermoplastic substrate (2) and with a thermoplastic lacquer cover layer (4) has diffraction markings 10, 12, 16, 17, 18 which can be altered for purposes of value cancellation by thermal energy and/or stamping or embossing. Markings are both machine readable by infra-red light and visible by the human eye and any alteration is detectable both by machine and eye. The visible alterations may provide different colours or a change between light and dark. The machine readable (5a, Fig. 7) and eye visible (5b) markings may be at different levels in the carrier (24). The carrier may be a pass, identity card, bank note or credit card.

Fig.5

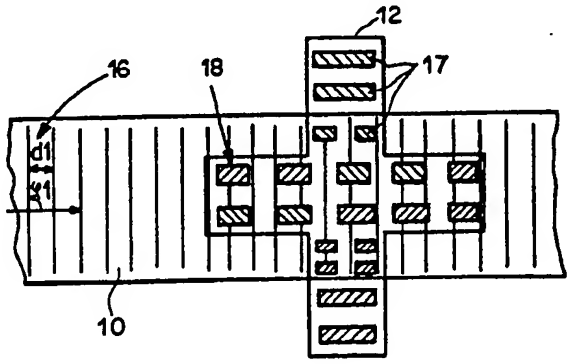

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Fig. 1

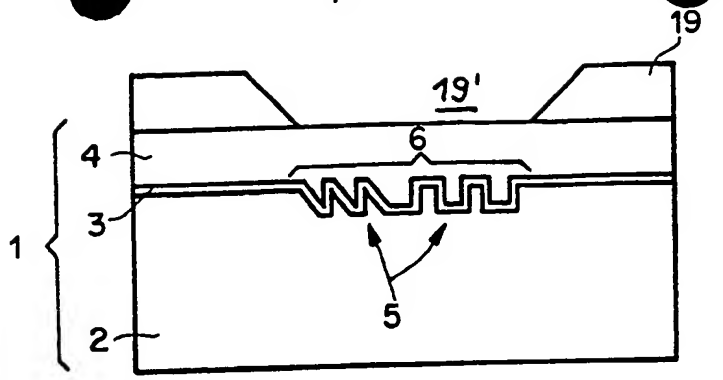


Fig. 2

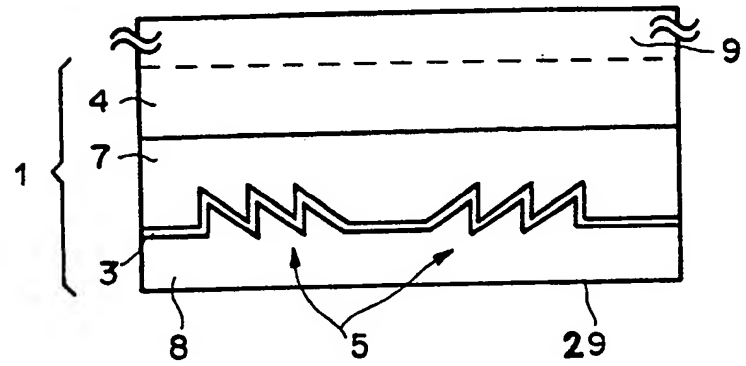


Fig. 3

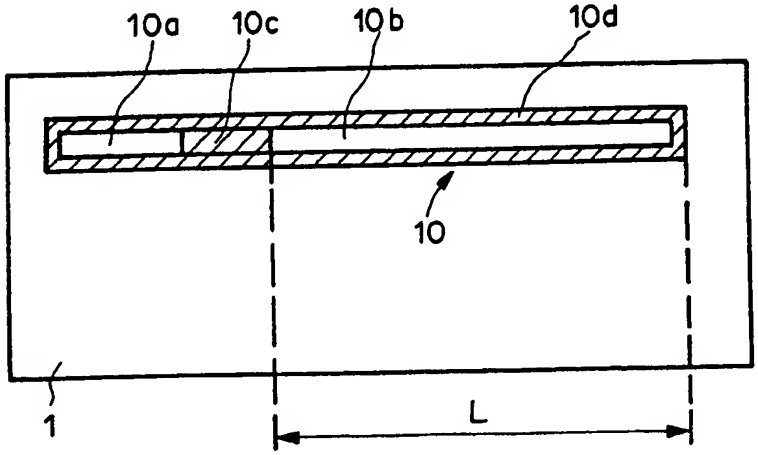


Fig. 4

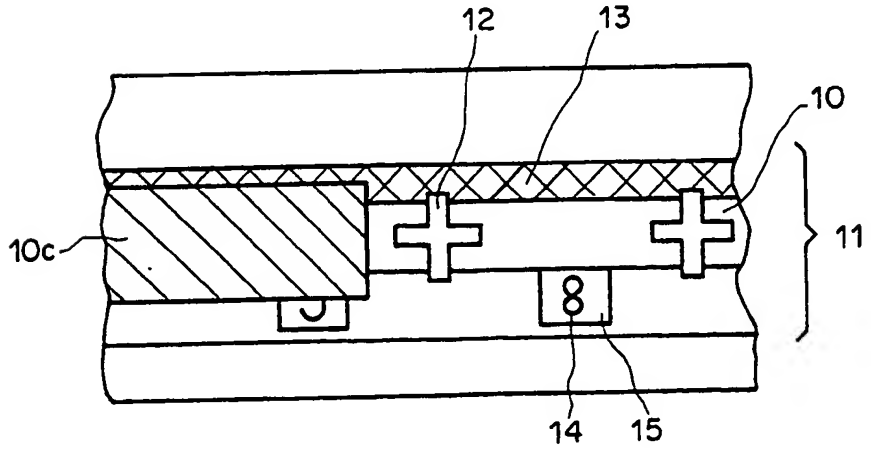


Fig.5

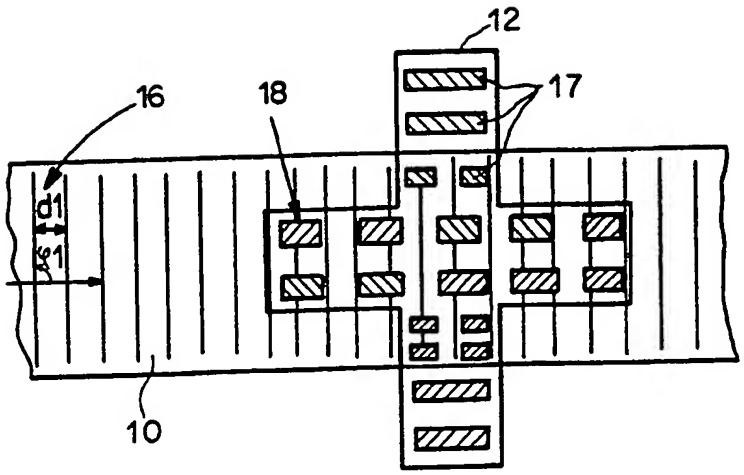


Fig.6

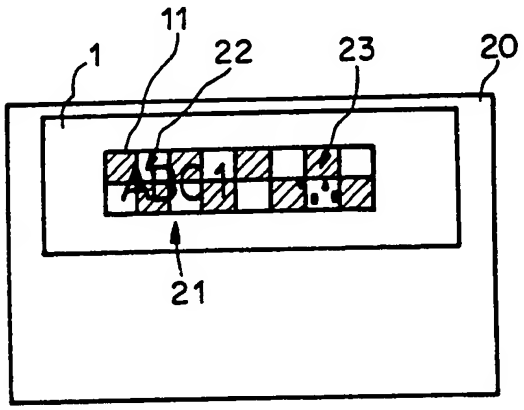
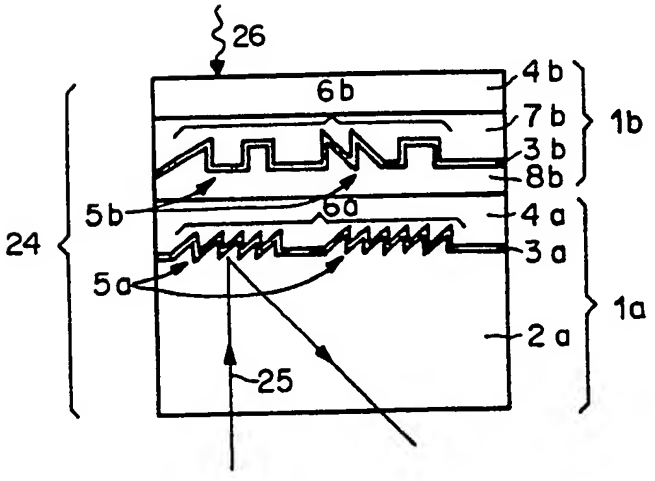


Fig.7



Information Carrier with Optical Markings

The invention relates generally to an an information carrier with optical machine-readable markings, the markings being formed as structures with a diffraction effect which are embedded into a substrate of thermoplastic material and a cover layer or a layer of lacquer of thermoplastic material and an adhesive layer and which can be altered by heating.

Such information carriers are used for example as so-called taxcards for cash-less telephoning at public call stations, and also as identification means, for example as a personal identity card in access monitoring systems. They are also suitable for use as security features on documents, passes, credit or charge cards, stocks and shares, bank notes and the like.

Swiss patent specification No. 604 215 discloses a device for cash-less payment for goods or services, wherein disposed on a value card in an information track are optical markings in the form of phase diffraction gratings which represent units of value. Value is deducted or cancelled by the erasure of optical markings. The residual value on the value card is proportionate to the length of the information track, which contains optical markings that have not yet been erased. For security reasons the units of value are arranged so as not to be visible to the human eye. Swiss patent specification No. 641 200 describes the use of a thermochromic layer of lacquer for representing the remaining residual value on the value card, which is disposed over the phase diffraction grating and the colour of which changes when value is thermally deducted from the card. A disadvantage with that solution is that more energy is necessary for producing the desired change in colour than for cancelling the units of value. In addition the application of the layer of lacquer requires an additional working operation and if the value card is only partially covered can result in the value cards being difficult to stack.

An information carrier of the kind to which this invention generally relates is known from Swiss patent specification No. 635 949. Items of machine-readable, optically coded information which in that case are included as optical markings in the form of a phase diffraction grating which is produced by an embossing operation represent units of value. The units of value are cancelled by the application of thermal energy to individual parts of the phase diffraction grating.

Swiss patent specification No. 594 935 discloses a process for the production of a document with optical markings, which can be coded by subsequently changing or erasing specific optical markings. Known methods such as a 2-out of-5 or a 3-out of-7 code can be used to represent numerical or alphanumeric characters, to provide protection from forgery. A coding operation of that kind admittedly provides that no other character is produced upon additional erasure of a further optical marking, but it requires a relatively large amount of storage space.

Swiss patent specification No. 604 215 discloses a process for the production of a surface relief image in a thermoplastic material, wherein in a first working operation a first diffraction structure is embossed at a temperature in the thermoplastic range of the material and wherein in a second working operation a second diffraction structure is embossed at a temperature in the thermoelastic range, the first diffraction structure being transformed into an elastic stress field which no longer has a diffraction effect. The diffraction effect can be restored to the first diffraction structure again by the application of thermal energy. The first diffraction structure may be inter alia a matt surface or a diffraction grating.

European patent specification EP 375 833 B1 discloses optically variable surface patterns which are suitable as security elements. It is known from European patent application EP 401 466 A1 for such colour patterns or surface patterns to be embossed in the form of a phase diffraction grating into a composite layer arrangement and for stamps to be stamped out of that composite layer arrangement, which stamps are stuck onto documents such as passes or means of payment, as authenticity features. In such composite layer arrangements, visible features are in the foreground.

The invention is based on the problem of providing an information carrier with optical machine-readable markings with a high level of safeguard against falsification or copying, which can be irreversibly cancelled or individualised by a specific change in individual optical markings, wherein the optical markings indicate a remaining residual value or the individualised information in such a way as to be visible and understandable to the human observer.

In accordance with the present invention, an information of the type to which this invention generally relates is characterised in that when the information carrier is observed and moved under normal lighting conditions the markings produce changing optical effects for a human eye and in that the machine-readable information and the visual impression of the markings, which is imparted to a human eye, can be altered by the local application of thermal energy only jointly.

The invention is characterised in claims 1, 7 and 14. Developments and advantageous configurations of the invention are set forth in the appendant claims.

The invention is based on the consideration of so designing diffraction structures that predetermined optical effects are produced in two defined wavelength ranges. A first embodiment has a single diffraction structure which on the one hand contains information which is machine-readable with infra-red light (IR) and which is protected from forgery or copying and on the other hand shows diffraction effects which are visually striking in visible light under normal illumination. Value cancellation or individualisation is effected by parts of

the diffraction structure being so altered that both infra-red and visible light for example is diffracted differently or diffusely scattered. In a second embodiment, a spatial combination of IR-effective and visually effective diffraction structures are provided as optical markings. The IR-effective structure contains the machine-readable information. The visually effective diffraction structures form one of the above-mentioned conspicuous colour patterns, for the human eye. Close local dovetailing provides that the IR-effective and visually effective structures of an optical marking which for example represents a unit of value can only be jointly altered.

A structure and process for the production of such diffraction structures are known for example from the following specifications: Swiss patent specifications Nos. 595 664, 604 279, 604 146, 604 215, 661 368 and 670 904, EP 401 466 A1 and Swiss patent specification No. 680 170 and are not described in greater detail here. Optical markings with such optically effective structures can be altered in many ways in terms of their optical properties, depending on their respective structure and the properties of a possible carrier material, either by a mechanical action, for example by means of an embossing punch, by virtue of a mechanical effect at elevated temperature, by virtue of heating with a heating element or with thermal radiation, or by laser ablation. The heat radiation source used may be a laser, with the advantage that it is possible to achieve a high degree of local resolution of the heated area.

By way of example, embodiments of the invention are described in greater detail hereinafter with reference to the drawings in which:

Figure 1 shows an information carrier with optical markings,
Figure 2 shows a further information carrier,
Figure 3 shows a value card,
Figure 4 shows a further value card,
Figure 5 shows a portion of the value card,
Figure 6 shows a document, and
Figure 7 shows a third example of an information carrier.

Figure 1 is a view in cross-section of an information carrier 1. It comprises a substrate 2 of thermoplastic material which is covered with a thin reflection layer 3 and a transparent cover layer 4. Optical markings 5 which represent zones with items of optically coded machine-readable and/or visible information are embedded in the form of a diffraction structure 6 in the substrate 2. The diffraction structure 6 can be a diffraction grating, a hologram, etc. It can be for example embossed directly or through the reflection layer 3 into the substrate 2 and then levelled off with the lacquer of the cover layer 4. The substrate 2, the reflection layer 3 and the cover layer 4 form a scarcely separable composite layer arrangement so that the optical markings 5 are embodied in such a way as to be safeguarded against forgery.

Figure 2 shows a further information carrier 1 with optical markings 5, which comprises a thermoplastic layer of lacquer 7 covered with a reflection layer 3 and an adhesive layer 8. A carrier foil 9 is applied to the layer of lacquer 7 on the side turned away from the reflection layer 3. The markings 5 are embedded in the form of a diffraction structure 6 in the layer of lacquer 7, the reflection layer 3 and the adhesive layer 8. By a transfer process, the information carrier 1 can be joined to the surface (not shown here) of a base card, a bank note, a document or the like. After the transfer operation the carrier foil 9 is removed and a cover layer 4 is applied. The cover layer 4 is applied to the layer of lacquer 7 up to a line which is shown as a broken line. The cover layer 4 is advantageously a thermally stable lacquer which can be printed upon, namely a lacquer having a softening point which is about 20°C higher than the softening point of the layer of lacquer 7. That provides that, in subsequent use of the information carrier 1, when items of information are to be altered in a cancellation device by the application of thermal energy by a so-called erasure head, the side of the surface of the information carrier 1, that is towards the erasure head, does not tend to stick to the erasure head. The lacquer used for the cover layer 4 is advantageously curable with UV (ultra-violett) light.

Figure 3 shows a plan view of an information carrier 1 which can be used as a value card for cash-less telephoning at public call locations. The value card has an information track 10 with optical markings 5 (Figure 1) which are machine-readable by means of infra-red light (IR). The information track 10 is divided into two portions 10a and 10b and is edged by a matt surface 10d. In one embodiment the markings 5 in the first portion 10a represent coded items of information with which certain parameters of the value card, such as for example the purpose of use thereof, are established. In the second portion 10b the markings 5 represent units of value while in a portion 10c if present the markings 5 are altered in such a way that they represent a cancelled unit of value. Individual markings 5 are altered in per se known manner by the application of thermal energy, for example by local heating of the surface of the substrate 2 which bears the markings 5, by means of a heatable erasure head. However the markings can also be altered by a mechanical effect such as a stamping-out operation or an embossing operation, with or without additional heating. A remaining residual value of the value card is established as the length L of the portion 10b whose markings 5 were not altered in the value-cancellation operation. In visible light, when the value card is tilted or turned, the unaltered markings 5 cause the portion 10b to appear in different colours in accordance with the laws of diffraction while the portion 10c which has been altered by the value-cancellation operation scatters incident light uniformly in all directions and therefore, like the surface 10d, appears as a reflection-free, matt surface. In that way the residual value of the value card can be easily perceived by eye with a safeguard against forgery at an unchanged high level as any change in the machine-readable information results in changes in the visual information.

Figure 4 shows parts of a value card with an information carrier 1 which is shown in Figure 2 and which is in the form of an information strip 11. The information strip 11 has optical markings 5 (Figure 1) which in addition to the information track 10 afford cross-shaped patterns 12, rhomboid patterns 13 and alphanumeric characters 14, the latter being arranged on surfaces 15 serving as a background. The information track 10 contains machine-readable information. The patterns 12 and 13 are of such a configuration that, when the value card is viewed and moved under normal lighting conditions, the patterns 12 and 13 produce conspicuous, changing optical effects, such as for example different colour effects or a change between light and dark. A further optical effect can provide that, out of a plurality of identical patterns 12 or 13, individual patterns are visible in a different colour or with a different level of brightness, the relative brightness or colour of the patterns 12 or 13 changing when the value card is turned or tilted. The patterns 12 occur in part in the information track 10. As will be described hereinafter with reference to Figure 5, they are of such a configuration that they do not influence the machine reading-out of the information in the information track 10. The characters 14 appear matt on surfaces 15 which are light or dark depending on the direction of illumination and viewing involved. The geometrical arrangement of the patterns 12, 13 and the surfaces 15 with the digits 14 and the dimensions of the erasure head of a reading device are so matched to each other that, when value is deducted from the value card there is a change in the patterns 12 and 13, the digits 14 and the surfaces 15, in which the patterns 12 and parts of the patterns 13, of the digits 14 and of the surfaces 15 preferably appear as a matt surface 10c. Cancellation of the portion 10c is particularly conspicuous by virtue of the fact that the matted surface of the portion 10c does not constitute the entire width of the information strip 11.

Figure 5 shows a portion on an enlarged scale of the information strip 11 with surface portions which are jointly used by the information track 10 and the pattern 12. The machine-readable diffraction structures 6 (Figure 1) are for example represented as grating structures 16 with a predetermined grating constant d_1 and a predetermined orientation ϕ_1. The patterns 12 are formed from sub-surfaces 17 which produce a high level of diffraction effectiveness in the visible range of the electromagnetic spectrum and which constitute only a fraction of the surface area of the information track 10 so that machine-readability of the grating structures 16 is guaranteed in spite of those optically effective sub-surfaces 17. The sub-surfaces 17 preferably have grating structures 18 with grating constants d_2 and orientations ϕ_2, which are different from those of the grating structures 16, wherein the values for d_2 and ϕ_2 can be different from one sub-surface 17 to another. Typical grating constants d_1, d_2, lie in the range of from 10 to 1 μm. The dimensions of the sub-surfaces 17 are advantageously such that they are not resolved by the naked eye at the normal viewing distance. By virtue of the locally close interconnection of the sub-surfaces 17 with the information track 10, a change both in the machine-readable grating structures 16 and also the visually conspicuous grating structures

18 alone is out of the question. From the technical point of view, the information track 10 and cross-shaped patterns 12 which partially overlap can be considered as a unitary item which is embodied in the form of a phase diffraction grating, with the grating structures 16 and 18, which is simultaneously embossed into the substrate 2 (Figure 1) or into the layer of lacquer 7 (Figure 2). It is further possible to print on the value card, with the exception of the information strip 11 or parts thereof, so that for example the first portion 10a (Figure 3) remains concealed from the human eye and the cover layer 4 of the information strip 11 is arranged at a depth in the value card because of the layer 19 which is produced in the printing operation (see Figure 1), so as to provide good protection from scratches in the cover layer 4, which could occur upon transportation or in use of the value card.

Swiss patent specification No. 594 935 describes a reading head for reading the information stored in a value card, with IR - light, comprising a light source and a plurality of light sensors. For reasons of compatibility, the parameters which essentially determine the optical behaviour of the grating structures 16 and 18 of the information strip 11, such as grating constants d_1,d_2, grating orientation ϕ_1, ϕ_2 and grating structure are to be of such a nature that the light of the light source is deflected onto the light sensors under conditions which are approximately unchanged relative to a value card without pattern 12, while visible light produces a conspicuous impression. In known reading devices the value card, for the reading operation, is inserted into a slot so that it is in the dark and protected from extraneous light. In addition the substrate 2 (Figure 1) or the layer of lacquer 7 (Figure 2) is advantageously coloured black in such a way that visible light is absorbed whereas infra-red light is transmitted. The operation of reading out the information by means of a reading-out beam is generally effected from the side 9 which is opposite to the cover layer 4 (Figure 1), but it can also be from the side of the cover layer 4.

By virtue of the transparent cover layer 4 and the close local dovetailing of the information contained in the information track 10, with the visually conspicuous patterns 12, the remaining residual value of the value card can be visually discerned without aid.

Patterns 12 can also be formed by the superimposition of two diffracting grating structures of which one is designed for the diffraction of infra-red light while the other is designed for the diffraction of visible light. In that case, besides the visual information, the sub-surfaces 17 also contain machine-readable information.

The substrate 2 of a value card with a structure as shown in Figure 1 is advantageously made of a material which is transparent for light in the visible and infra-red range. The material may be crystal-clear or lightly coloured. The optical markings 5 of the information track 10 (Figure 3) are then visible from the back side of the value card, the side from which the machine is reading the optical markings 5 by means of a reading beam. The front side of the value card is

thus available for a printing image without any recess so that a recess 19' in the layer 19 is not necessary. The result is an excellent protection of the optical markings 5 from scratches and the artistic design of the front side of the value card is less restricted. The cancellation of value is made by alteration of the optical markings 5 by means of locally limited application of thermal energy through the front side of the value card allowing the simultaneous control of the alteration of the markings 5 from the back side. The remaining residual value of the card can be recognised visually by the owner from the back side.

A value card consisting of a base card having an information carrier 1 embedded into or glued onto its front surface, the carrier having a structure as shown in Figure 2, provides the same advantages if the base card is made of transparent material and if the front surface including the information carrier 1 is all-over printed on.

Such a value card is particularly well suited for use as a taxcard.

With a suitable visual configuration and arrangement of optical markings 5 the information carrier 1 can also be used as a codeable, machine-readable security element, in which case the information content can be embossed for example with an embossing punch after the actual production process. Such a document is substantially protected from forgery and copying because subsequent changes to the markings 5 bearing machine-readable information are immediately perceptible by eye.

Figure 6 shows a document 20 with an optical information carrier 1 which has the information strip 11. The optical markings 5 (Figure 1) produce a chequered pattern 21 which is suitable as a security feature by virtue of the optical effect that adjacent areas of the chequering interchange their light and dark appearances respectively, depending on the respective lighting and viewing direction involved. In order clearly to identify the document 20, alphanumeric characters 22 and elements 23 are formed in the information strip 11 in an individualisation procedure, the appearance thereof being matt by virtue of the selected method of manufacturing the information carrier 1. In the individualisation procedure, there is an irreversible change in the chequered pattern 21 by virtue of the fact that the matting which has once been produced, in the form of the characters 22 and the elements 23, cannot be reversed. The elements 23 represent an item of coded information which is admittedly visible but not directly comprehensible. As the markings 5 which form the pattern 21 are machine-readable, the alphanumeric characters 22 are also readable by machine with a suitable reading device. The elements 23 are however easier to interpret. With local interlocking of the alphanumeric characters 22 and the elements 23, it can be provided that neither the alphanumeric characters 22 nor the elements 23 can be individually altered, so that the information which can be read by eye and the information which can only be read by machine cannot be individually altered. The document 20 can be a pass, an identity card, a bank note,

a credit card, any other value card and also an identification card for an access monitoring system, which in that way can be provided with an individual identification. Machine reading and visual perception take place from the same side.

The information strip 11 can also be made up from similar optical markings 5 which in the unaltered condition appear either all light or all dark depending on the respective viewing and illumination direction involved, but which appear matt in the altered condition. In that way it is possible to represent an item of graphic or pictorial information, insofar as an image is prepared in a scanning image of light and dark image points and transferred into the information strip 11 by an altered marking 5 being associated with a light image point and an unaltered marking 5 being associated with a dark image point or vice-versa in which case the unaltered markings 5 further form a security feature. In particular a photograph of a person can be produced as such a scanning image on an optical information carrier 1 and stuck into a document such as a pass, a credit card, a driving licence and the like. A photographic process in particular is appropriate for transferring the scanning image onto the information strip 11, in which case the scanning image serves as a negative for exposure of the information strip 11 with heat radiation. A change in the optical behaviour of the markings 5 can also be effected by local laser ablation of the reflection layer 3, in which case the laser beam can be guided in per se known manner by means of a computer-controlled apparatus. Those optical methods afford the advantage of not involving contact.

Such an information strip 11 is also suitable for subsequent labelling with a self-checking bar code which can be read out with a self-timing control effect, for example in accordance with MIL-STD-1189, in accordance with the "European Article Numbering Code" EAN etc. A forged bar code can no longer be read.

Production of optical information carriers 1 of that kind can be effected in an inexpensive fashion in a batch process, as the individualisation operation can be subsequently effected using simple means. By means of a serially numbering embossing stamp, information carriers 1 can be for example numbered and welded onto bank notes. The information involved can consist of both a part which is comprehensible to a human observer such as a name or a number and also a coded part, for example in the form of a bar code, wherein those codings are advantageously used, in which a subsequent change in an optical coding 5 serving as a coding element produces an element which falls outside the code.

By virtue of the various processes referred to above for embossing structures with an optical effect into thermoplastic material, it is possible to adopt combinations of a wide range of kinds in order to control the visual effect in the individualisation operation. When using thermoplastic materials which contain a diffraction structure that initially does not have an optical effect, in the form of an elastic stress field, it is for example possible to produce an optical effect on

parts of the diffraction structure by locally limited application of thermal energy, so that alphanumeric characters 22 appear in an information strip 11 acting as a matt background, which, when viewed and moved in visible light, light up in changing colours, with varying brightness and/or in a changing sequence.

Figure 7 shows an information carrier 24 in the form of a combination of a first information carrier 1a, as is shown in Figure 1, and a second information carrier 1b, as is shown in Figure 2. The diffraction structures 6a are arranged in a first plane in a first composite layer arrangement 2a, 3a, 4a, and represent machine-readable optical markings 5a. The diffraction structures 6b are arranged in a second plane in a second composite layer arrangement 8b, 3b, 7b, and represent visually visible optical markings 5b. Visual observation of the information carrier 24 is from the side of the cover layer 4b while machine reading by means of a reading beam 25 is effected from the opposite side 2a. Both the visual impression and machine reading are based on the reflection of incident light at the corresponding reflection layers 3b and 3a respectively, but from mutually opposite sides, so that there are no troublesome interference effects. In that way the diffraction structures 6a can be fashioned completely independently of the diffraction structures 6b. A change in the diffraction structures 6a is effected by locally limited application of thermal energy 26 from the side of the cover layer 4b so that on the one hand the optical effectiveness of the alteration can be monitored by machine by means of the reading beam 25 during the alteration and on the other hand the diffraction structures 6b are also altered as the heat flows from the cover layer 4b through the diffraction structures 6b to the diffraction structures 6a.

CLAIMS

1. An information carrier (1) with optical machine-readable markings (5), the markings being formed as structures (6) with a diffraction effect which are embedded into a substrate (2) of thermoplastic material and a cover layer (4) or a layer of lacquer (7) of thermoplastic material and an adhesive layer (8) and which can be altered by heating, characterised in that when the information carrier (1) is observed and moved under normal lighting conditions the markings (5) produce changing optical effects for a human eye and in that the machine-readable information and the visual impression of the markings (5), which is imparted to a human eye, can be altered by the local application of thermal energy only jointly.

2. An information carrier (1) according to claim 1 characterised in that the markings (5), when altered, appear matt or specular.

3. An information carrier (1) according to claim 1 or claim 2, characterised in that the substrate (2) consists of a material which is transparent in the visible and infra-red range making the optical markings (5) visible through the substrate (2).

4. An information carrier (1) according to any one of claims 1 to 3 for use as a value card and having an information track (10) comprising the machine-readable markings (5) which represent units of value in a portion (10b) of the information track (10), characterised in that when the value card is tilted in visible light the markings (5) in the portion (10b) cause the portion (10b) to appear in different colours and that a portion (10c) with cancelled units of value has markings (5) which are altered in such a way that a remaining residual value can be discerned by eye.

5. An information carrier (1) according to any one of claims 1 to 3 for use as a value card and having an information track (10) comprising the machine-readable markings (5) which represent units of value in a portion (10b) of the information track (10), characterised in that the information track (10) has patterns (12) which are formed from further markings (5) and which, when the information carrier (1) is observed and moved in visible light, produce changing optical effects and which are arranged in such a way that upon local application of thermal energy the machine-readable information in the information track (10) and the visual impression of the patterns (12) that is imparted to a human eye can be altered only jointly.

6. An information carrier (1) according to claim 4 or claim 5 characterised in that parts of the information carrier (1) are printed upon, whereby the information track (10) is arranged at a depth.

7. An information carrier (1) with optical markings (5), the markings being formed as structures (6) with a diffraction effect which are embedded into a substrate (2) of thermoplastic material and a cover layer (4) or a first layer of lacquer (7) of thermoplastic material and a second layer of lacquer (4) and which can be altered by heating, characterised in that the information carrier (1) has an information strip (11) whose markings (5) produce optical effects serving as a security feature and that for the purpose of individualisation the optical behaviour of individual markings (5) in the information strip (11) can be altered by the application of heat or by mechanical means.

8. An information carrier (1) according to claim 7 characterised in that the information strip (11) can be provided with labelling (22) by altering individual optical markings (5).

9. An information carrier (1) according to claim 8 characterised in that the labelling (22) is readable by machine and by eye.

10. An information carrier (1) according to any one of claims 7 to 9 characterised in that the information strip (11) can be provided with elements (23) representing an item of coded information, by altering individual optical markings (5).

11. An information carrier (1) according to claim 7 or claim 10 characterised in that the information strip (11) represents a bar code field after the individualisation operation.

12. An information carrier (1) according to claim 7 characterised in that the information strip (11) can be provided with a scanning image comprising altered and unaltered optical markings (5).

13. The use of an information carrier (1) according to any one of claims 7 to 12 for identifying a document (20), a credit card, a value card, a bank note, an identity card or a pass.

14. An information carrier (24) with optical machine-readable markings (5a), the markings being formed as structures (6a) with a diffraction effect which are embedded in a first plane in a first composite layer arrangement (2a, 3a, 4a) and can be altered by heating, characterised in that:
further optical markings (5b) in the form of structures (6b) with a diffraction effect are provided in a second plane in a second composite layer arrangement (8b, 3b, 7b), which further optical markings produce changing optical effects when the information carrier (24) is observed from

the side of a cover layer (4b) covering the second composite layer arrangement (8b, 3b, 7b) and is moved in visible light;
reading of the machine-readable markings (5a) is effected by means of a reading beam (25) from the side (2a) that is opposite to the cover layer (4b); and
the machine-readable markings (5a) and the further markings (5b) can be only jointly altered by the local application of thermal energy (26) from the side of the cover layer (4b), wherein the alteration in the machine-readable markings (5a) can be monitored by means of the reading beam (25).

15. An information carrier substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(T' Search report)

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Application number
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Relevant Technical Fields

(i) UK Cl (Ed.N) B6A AK, AL, ATC

(ii) Int Cl (Ed.6) B42D 15/10, G06K 19/16, 19/18

Search Examiner
R J DENNIS

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Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI; JAPIO

Documents considered relevant following a search in respect of Claims :-
1 TO 6 AND 14

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2115349 A	(STANDARD) see particularly lines 70, 71 and 100 to 104, page 2	1 at least
Y	WO 92/22039 A1	(ATHERTON)	1 at least
Y	US 5104471	(LANDIS)	1 at least
Y	US 4501439	(LANDIS)	1 at least
Y	US 4184700	(LANDIS)	1 at least

Databases:The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).